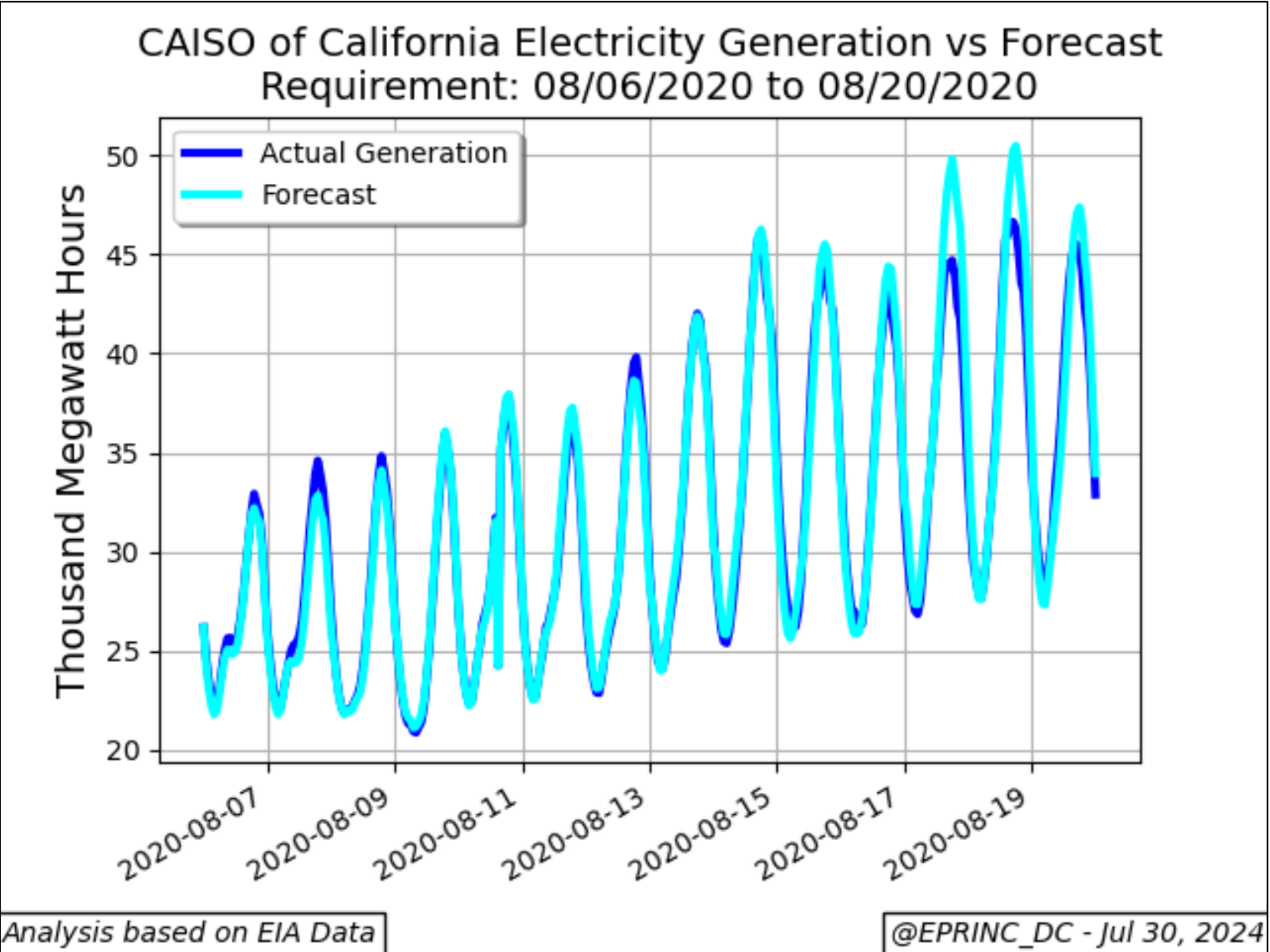


# ***EPRINC Power Demand Working Group*** **The Case of California**

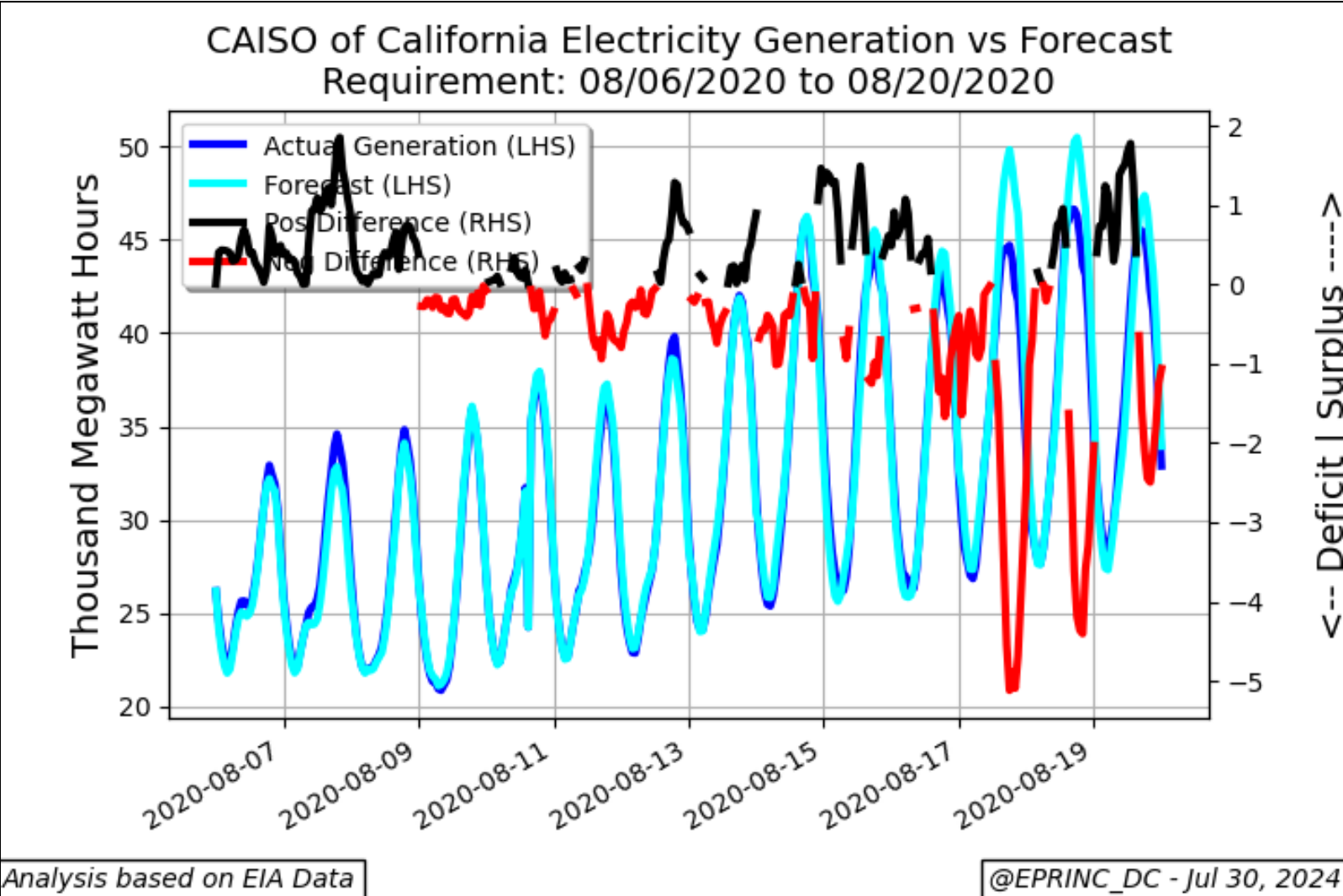


**Max Pyziur**  
**August 2, 2024**  
**Washington, DC**

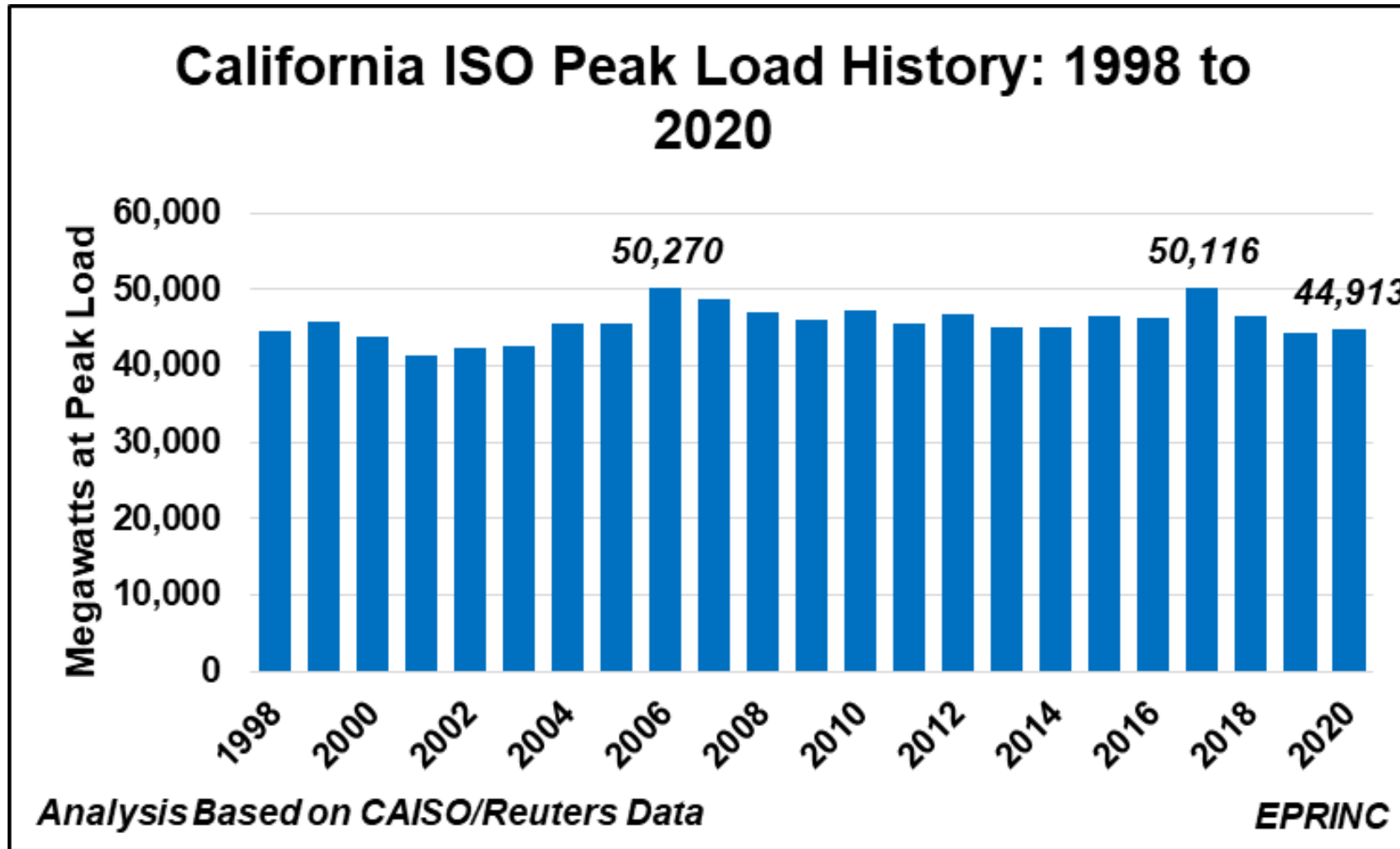
# August 2020 Blackout: Load vs Forecast



# August 2020 Blackout: Load vs Forecast Surplus vs Deficit



# August 2020 Blackout – Context



**First rolling  
blackout of 2020**



# Key Events Impacting California's Electricity Generation & Distribution



## Fires

- **September 2015** — PG&E equipment starts Butte Fire burning 549 homes and causing 2 fatalities.
- **October 2017** — PG&E equipment starts numerous fires destroying 1,745 homes and causing 22 fatalities.
- **November 2018** — PG&E equipment starts Camp/Paradise Fire burning almost 14 thousand homes and causing 85 fatalities.
- **Aug/Sept 2020** — Approximately 2 million acres of wildfires across the state; none attributed to electricity generation or distribution.

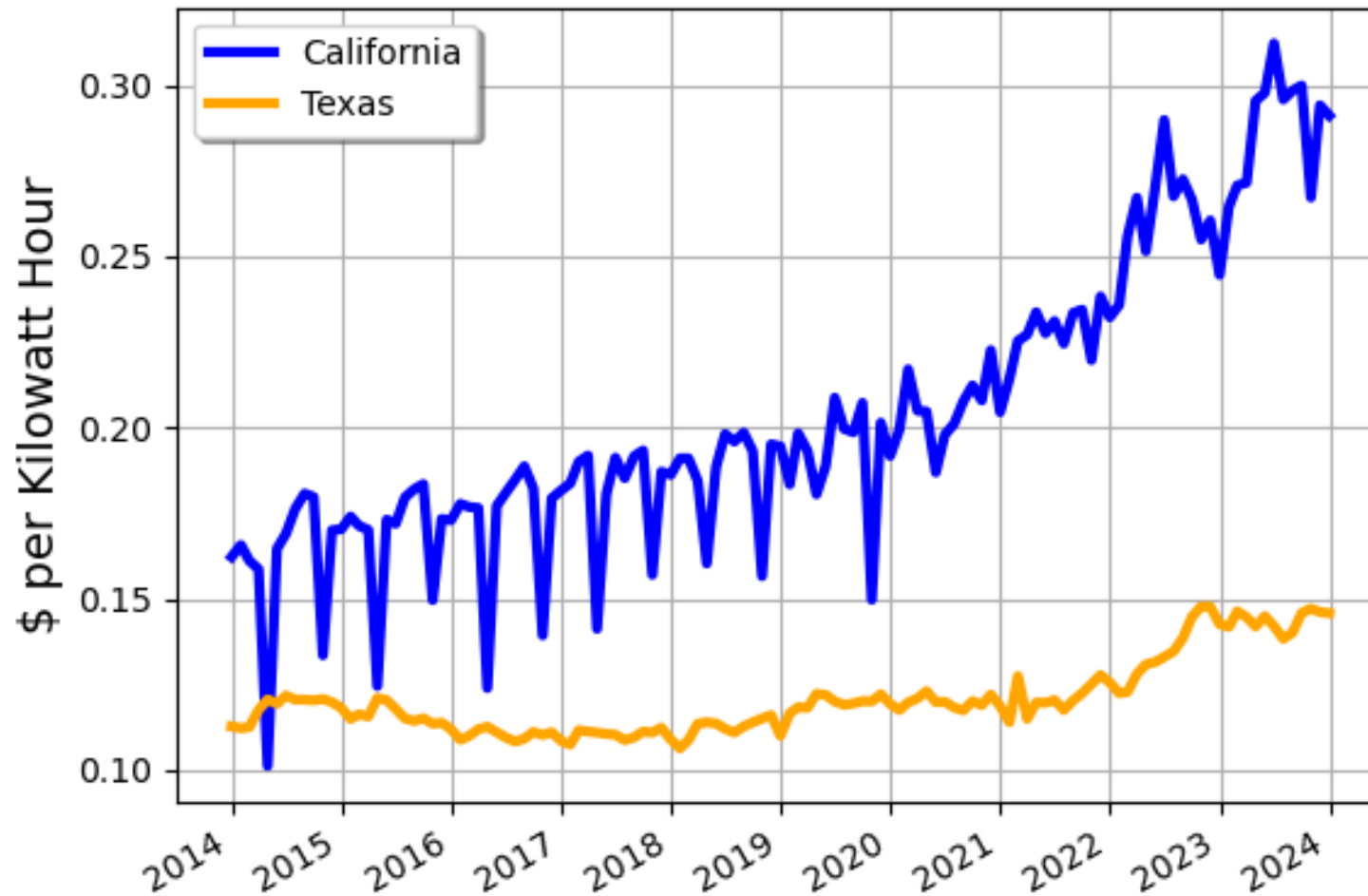
## Blackouts

- **Oct/Nov 2019** — PG&E, SCE, & SDE shut off large portions of their grids as a precaution to prevent fires; 2.5 million people affected in northern California. "Inverse condemnation" legal precedent holds that utilities liable for damages from fires caused by their equipment even if they aren't at fault.
- **Aug/Sept 2020** — Numerous rolling blackouts ordered by CAISO affecting 200 to 250 thousand customers at a time

## Bankruptcies

- **January 2019 - July 2020** — PG&E declared bankruptcy due to rising liabilities from wildfires

## Monthly Residential Electricity Prices: 12/23/2013 to 12/31/2023



Analysis based on EIA Data

Energy Policy Research

# Key Legislative Predicates



## Supply Chain Deregulation

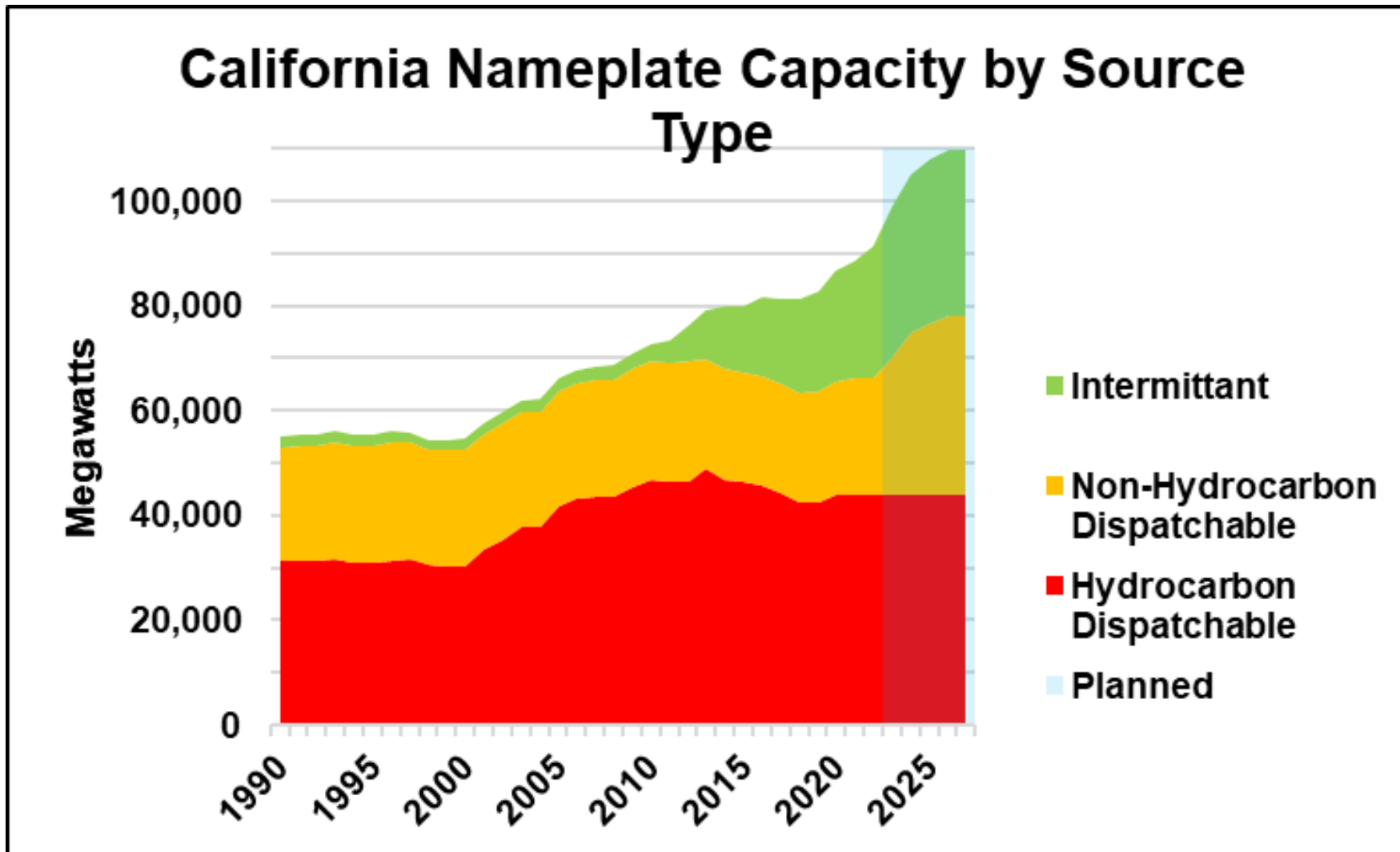
- **1978 — The Public Utility Regulatory Policies Act (PURPA)**: Ended utility control of the entire electricity supply chain by requiring them to purchase from entities making small amounts of electricity, ending their monopsony. Created to promote energy conservation and promote greater use of domestic energy and renewable energy.
- **1996 — Federal Energy Regulatory Commission (FERC) Orders 888 and 889 - Open Access Rule**: Introduced competition in the wholesale production of electricity

## California Legislation Establishing and Modifying Renewable Portfolio Standards (RPS)

- **2002 — SB 1078**: Established California's Renewable Portfolio Standard (RPS)
- **2015 — SB-350 Clean Energy and Pollution Reduction Act**: Requires utilities and sellers to provide 50 percent of sales from renewable energy by 2030.
- **2017 — SB-100**: Establishes a state policy of 100 percent zero carbon electricity by 2045. Percentages increase over time from 20 percent in 2010 to 60 percent in 2030.

## California Legislation Targeting Greenhouse Gas (GHG)

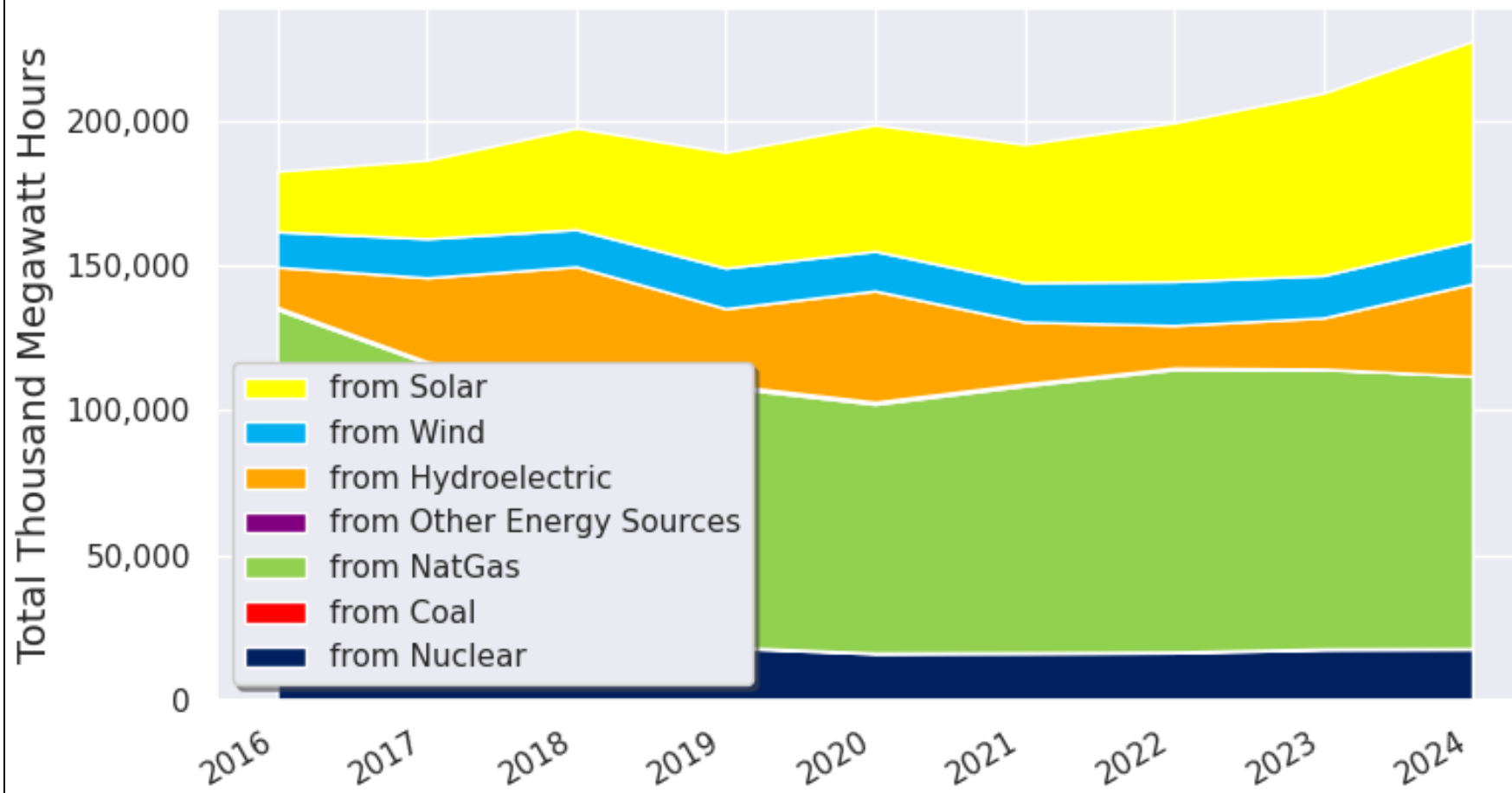
- **2006 — AB/SB-32 California Global Warming Solutions Act**: Regulate Green House Gases (GHG) mandating reductions statewide to 1990 levels by 2030)
- **2007 — SB-1368**: Effectively prohibits load-serving entities (LSEs) from signing or extending long-term contracts with coal power plants.



Shaded area is planned.



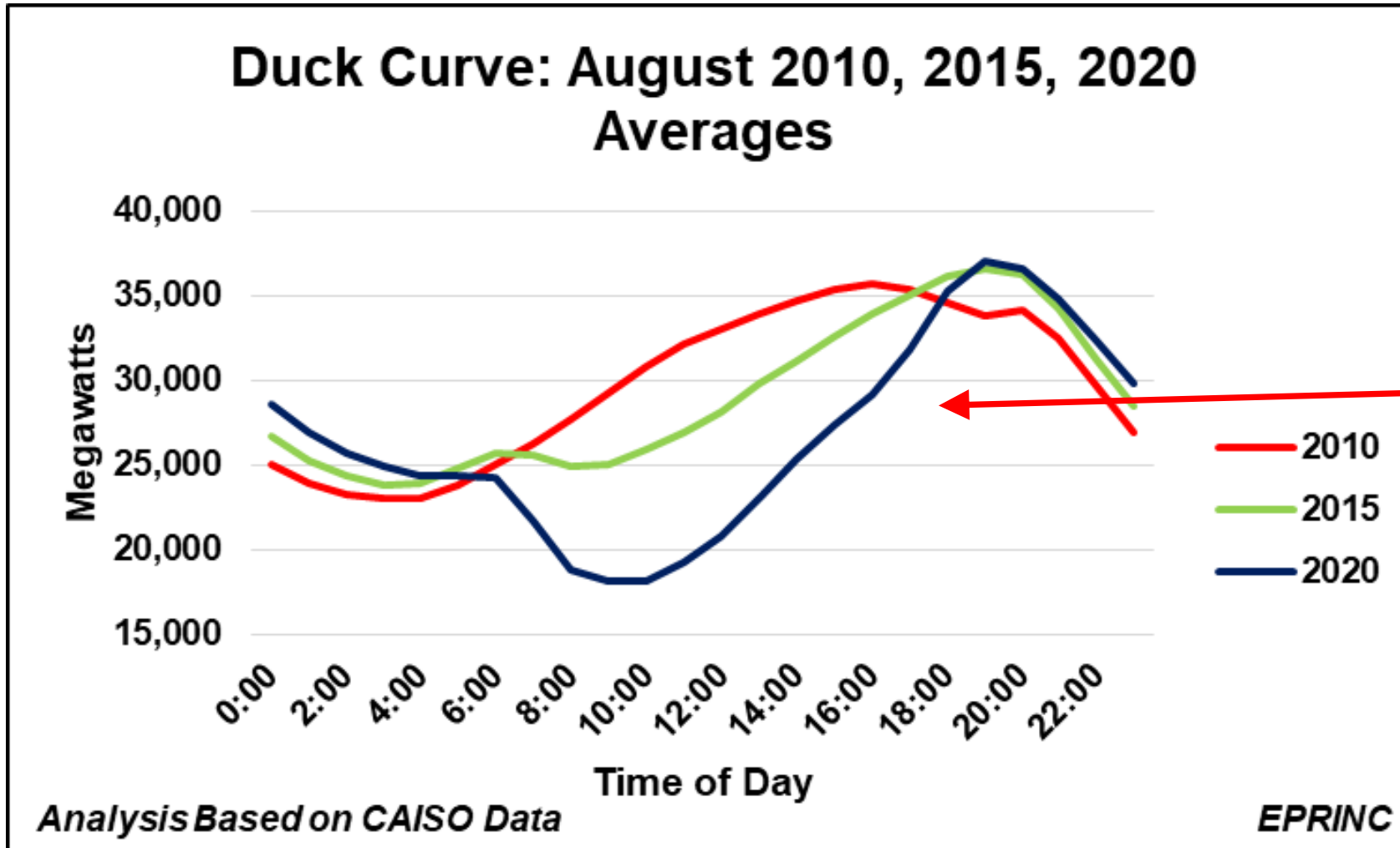
### California Annual Electricity Production: 12/31/2015 to 12/31/2023



Analysis based on Annual EIA Data

@EPRINC\_DC - Jul 31, 2024

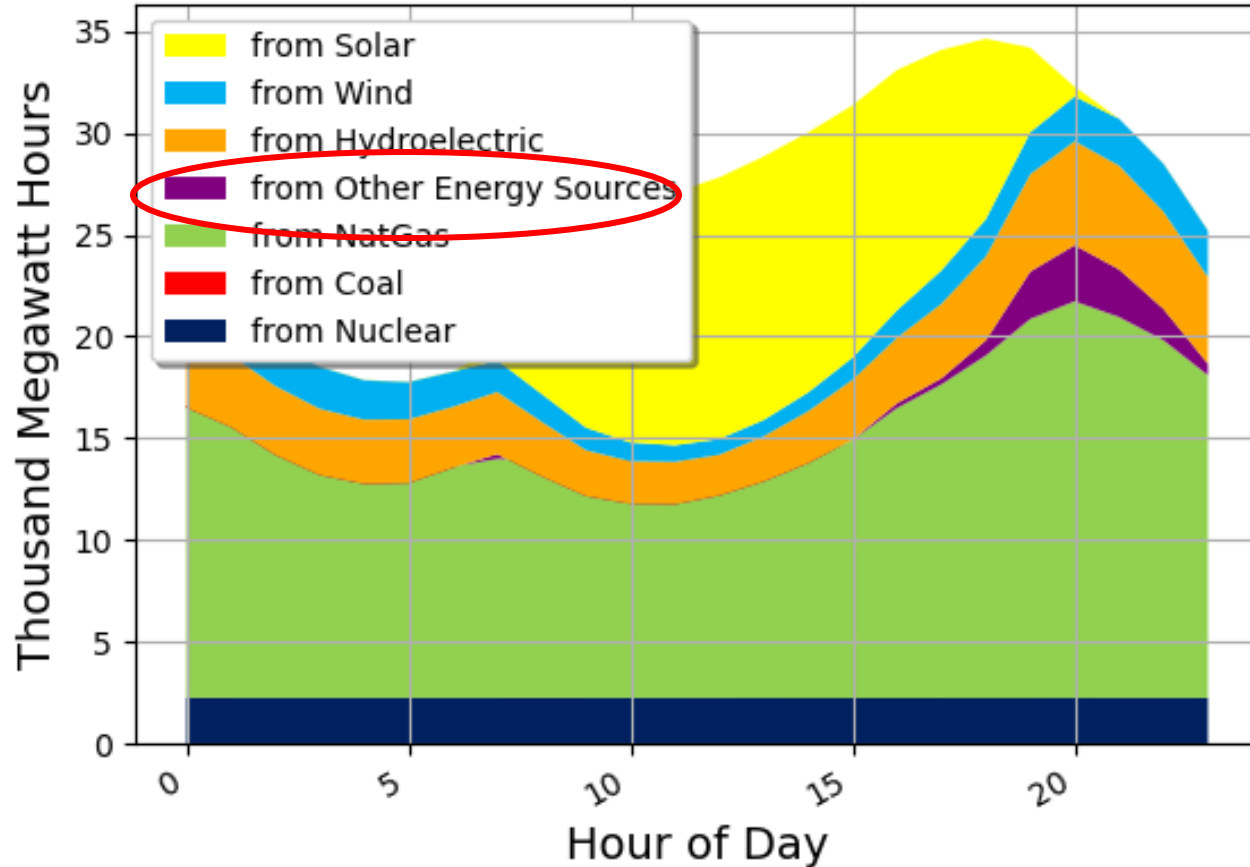
# Duck Curve Evolution: High RPS Requirements From Solar Lead to High Thermal Ramp Rate



2020 late afternoon / evening demand requires a 16,000 MW ramp in seven hours. Or 40 MW/minute. This was primarily delivered by simple-cycle/peaker natural gas generation.

# California's Duck Curve: August 2023 now with Battery Storage

CAISO of California Average Hourly Electricity  
Production: from 07/31/2023 to 08/31/2023



August 2023 late afternoon / evening demand required an 16,000 MW ramp in 7 hours. Or almost 40 MW/minute.

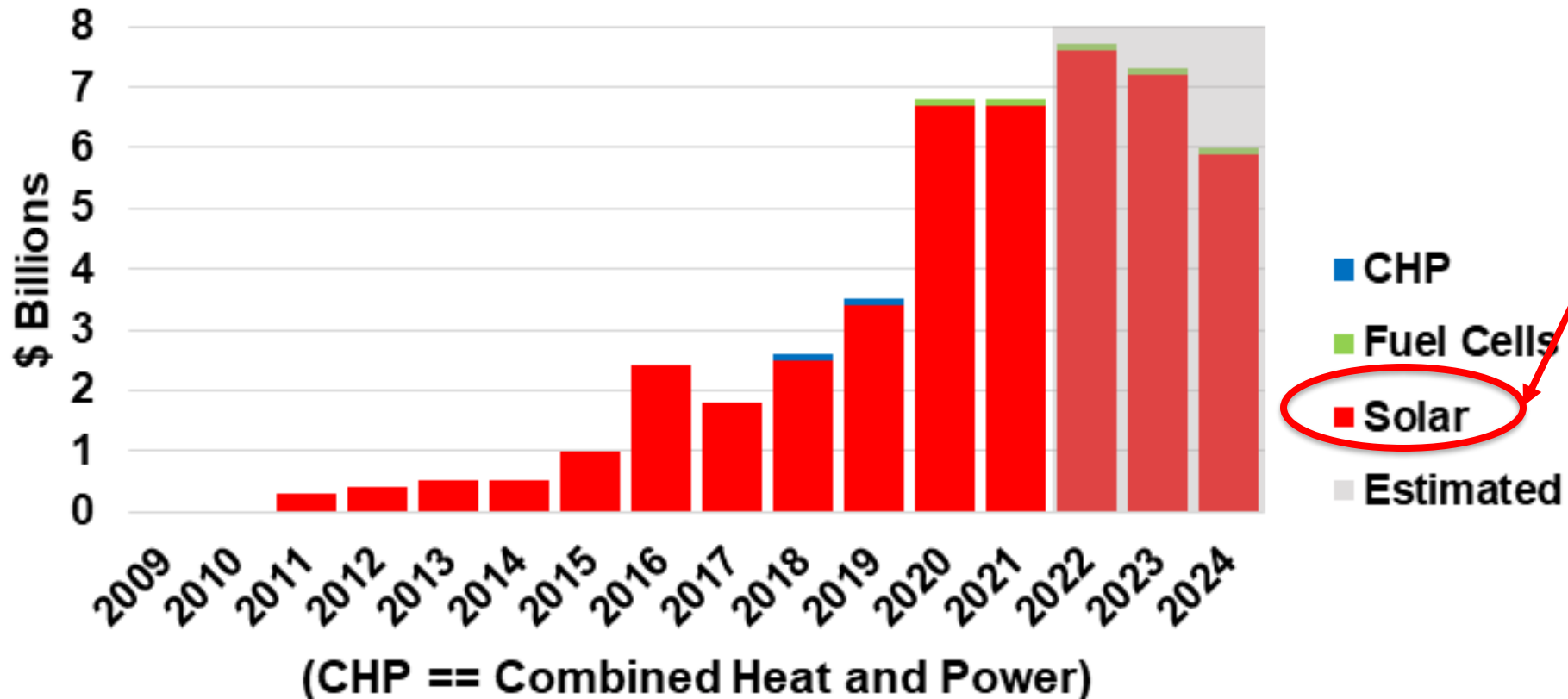
Of this, 20 MW is delivered by simple-cycle/peaker natural gas generation with the balance of 8, 7, and 3 MW/minute from battery storage, hydro, and wind, respectively.

(Currently, EIA does not disaggregate utility-scale battery storage from other lesser-used sources placed in this category.)

Analysis based on Hourly EIA Data

@EPRINC\_DC - Aug 01, 2024

# Foregone Tax Revenues from U.S. Federal Renewable Electricity Investment Credits



Through 2024, the U.S. Congressional Joint Committee on Taxation (JCT) is projecting that foregone tax revenues for renewable ITCs will be \$47.4 billion of which \$46.9 billion will be for solar.

Analysis Based on JCT & CRS Data

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# California's Electricity Costs: Calculating PPA feed-in tariffs

Multiply this ...

Market Price Referent (MPR), per-kWh			
Generation Start Year	10 Year Contract	15 Year Contract	20 Year Contract
2008	0.093	0.094	0.096
2009	0.093	0.095	0.097
2010	0.094	0.096	0.098
<i>Analysis Based on PG&amp;E Data</i>			<i>EPRINC</i>

times this ...

Time Of Day Factor			
	1pm - 8pm, No weekends	7am-Noon, M-F, 7am- 8pm Weekends	1am-6am
Monthly Period	Super-Peak	Shoulder	Night
June To Sep	2.037	0.921	0.700
Oct To Feb	1.203	1.049	0.841
Mar To May	1.030	0.855	0.656
<i>Analysis Based on PG&amp;E Data</i>			<i>EPRINC</i>

to get this ...

Feed-In Tariffs - 20yr signed in 2010, per-kWh			
	1pm - 8pm, No weekends	7am-Noon, M-F, 7am- 8pm Weekends	1am-6am
Monthly Period	Super-Peak	Shoulder	Night
June To Sep	0.200	0.091	0.069
Oct To Feb	0.118	0.103	0.083
Mar To May	0.101	0.084	0.065
<i>Analysis Based on PG&amp;E Data</i>			<i>EPRINC</i>

Source:

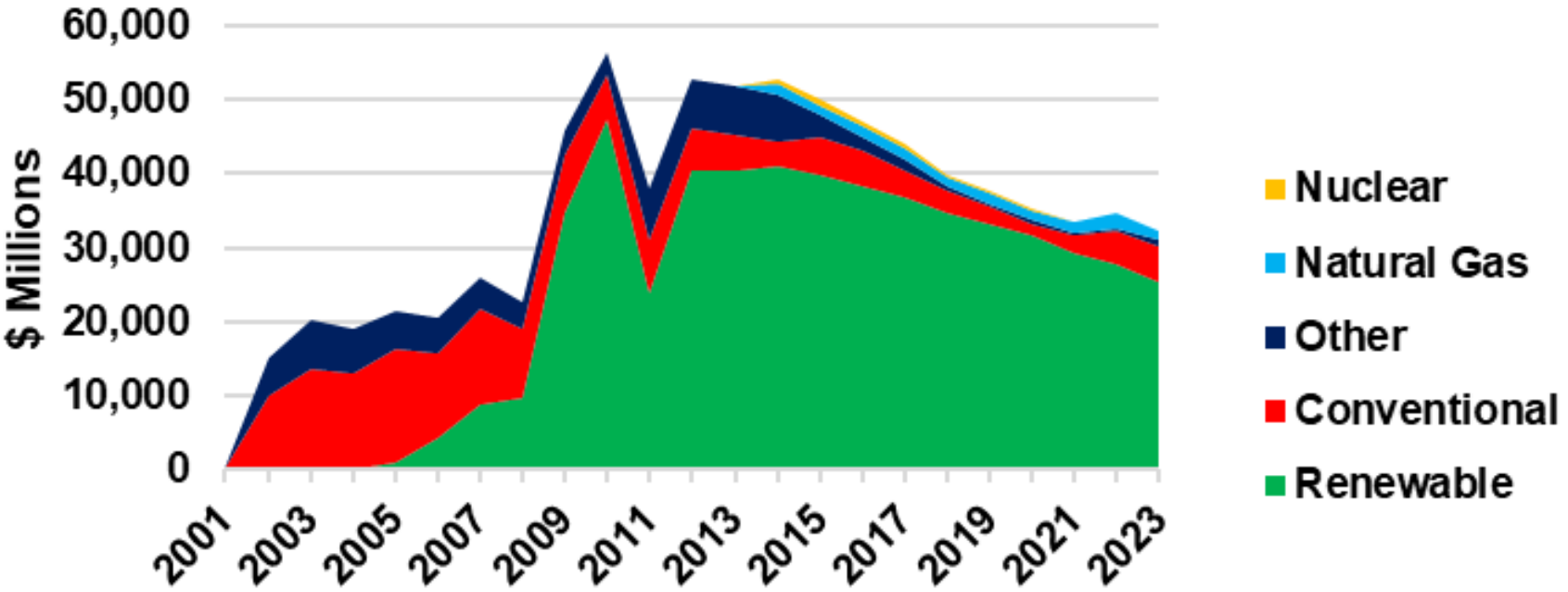
[https://www.pge.com/includes/docs/pdfs/b2b/wholesaleelectricitysuppliersolicitation/Feedin\\_Tariffs\\_FAQs.pdf](https://www.pge.com/includes/docs/pdfs/b2b/wholesaleelectricitysuppliersolicitation/Feedin_Tariffs_FAQs.pdf)



# PG&E Year-End Cumulative PPA Commitment



## PG&E Outstanding Undiscounted Year-End Value of Power Purchase Agreements (PPAs) 2002 -2023

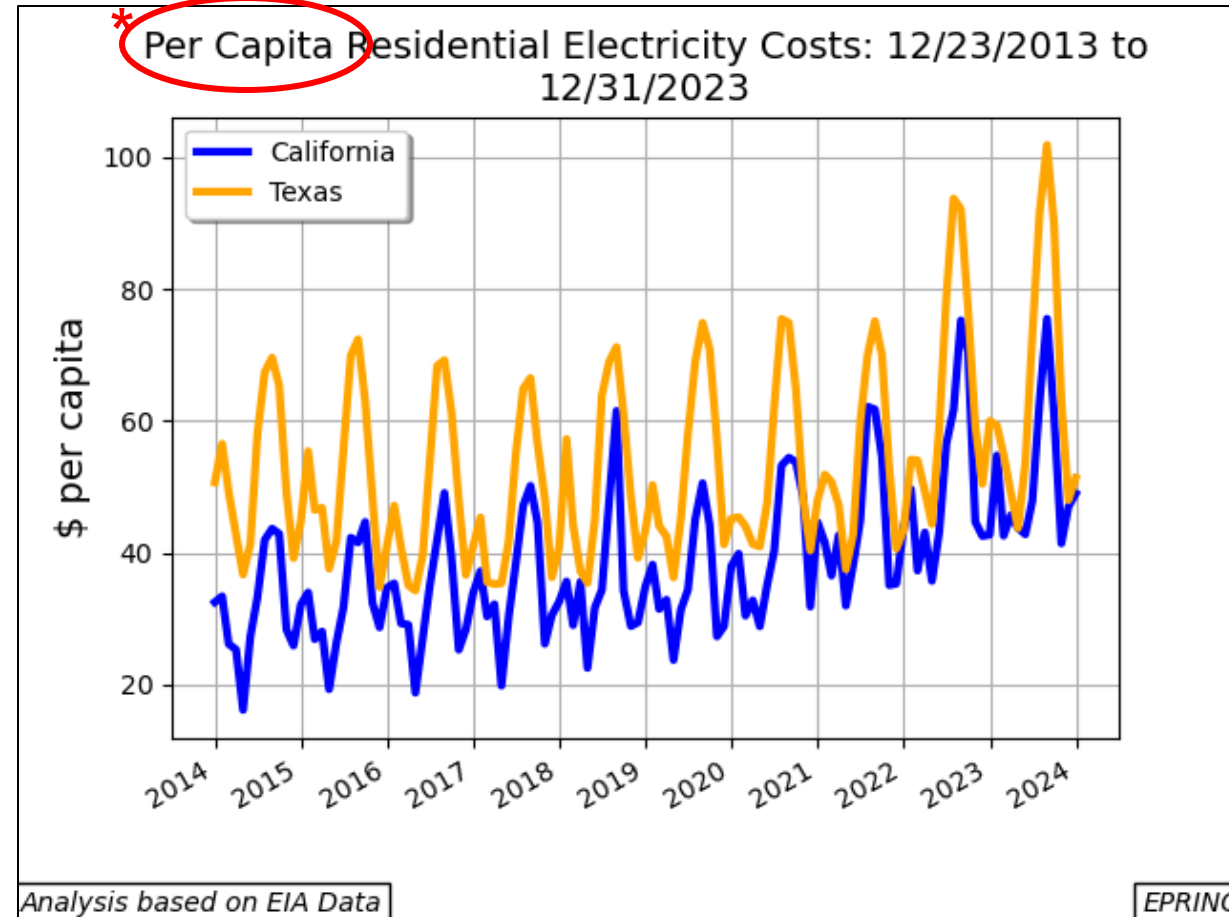
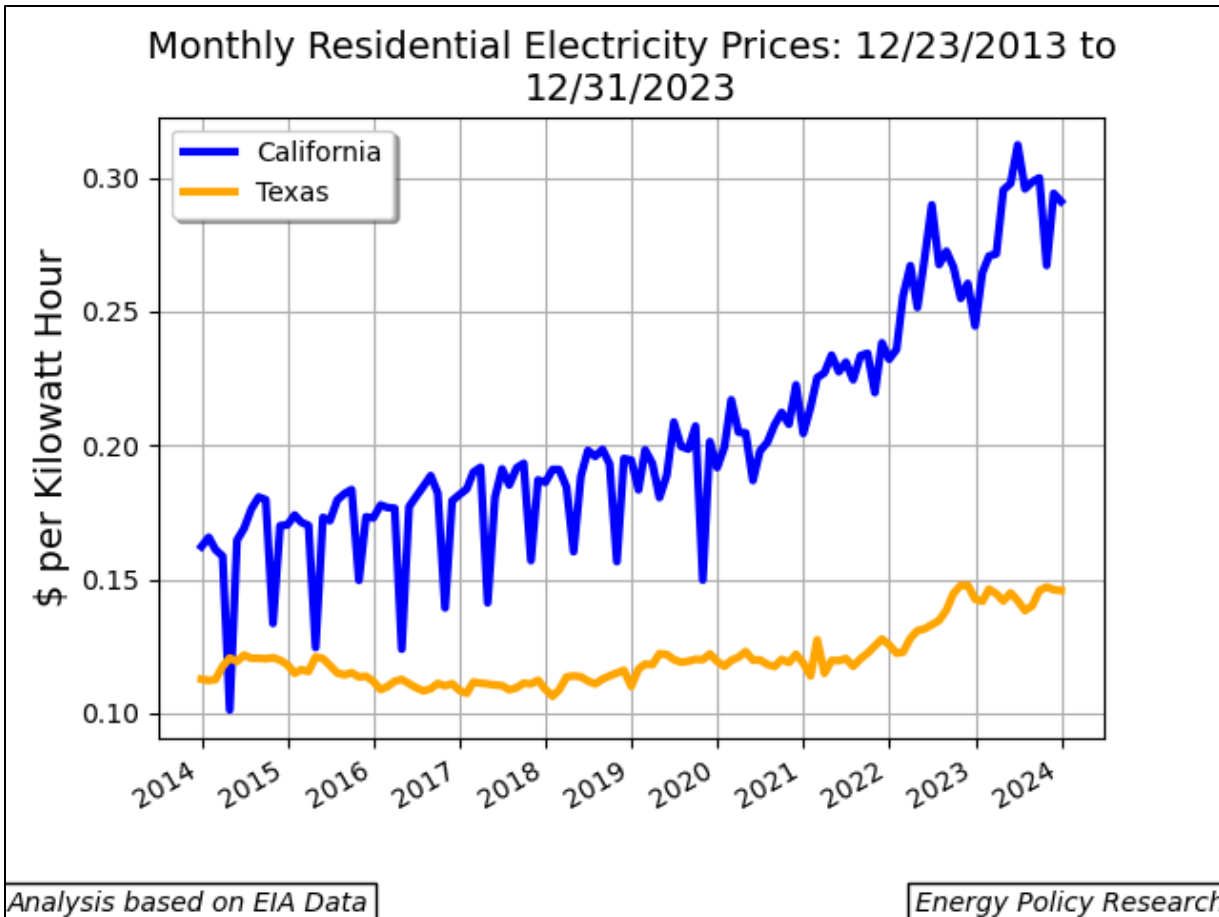


In 2023, Renewable PPA's scheduled to expire as late as 2043

Analysis Based on PG&E 10-K Data

EPRINC

# Monthly Residential Electricity Prices Unit Costs vs Per Capita



\* **Per Capita Cost = (Unit Cost \* Total Residential Consumption) / Population**

# California Public Utilities Commission Affordability Monitoring



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## 2021 and 2022 Annual Affordability Refresh

[2021 and 2022 Annual Affordability Report](#)

### Metrics Data and Interactive Maps

Below are the downloadable tabular files, interactive maps, and raw data work papers for Areas of Affordability Concern, Affordability Ratio at the 20th Percentile, and Hours at Minimum Wage.

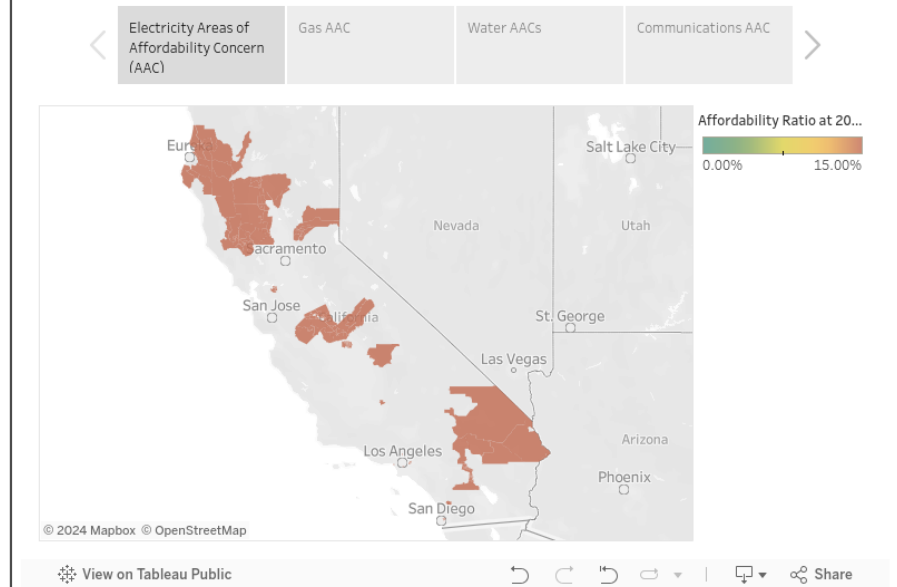
### 2021 and 2022 Affordability Ratio Calculators

This year, staff has prepared an updated AR calculator for historical analysis of 2021 using the same methodology that was used in the prior year's affordability analysis (affordability analysis based on historical essential usage bills for 2021 and the 1-year 2021 sample of American Community Survey, or ACS, microdata). In a change from prior years, staff has also prepared a second draft AR calculator for historical analysis of the year 2022. This second calculator uses the same methodology that was used in prior years, but features more up-to-date historical essential usage bills for electricity, natural gas, and Class A water utilities. All other water essential usage bills, as well as communications essential usage bills, are based on 2021 values and adjusted for inflation. Income and housing cost data for 2022 in this version of the calculator is based on 2021 ACS microdata and adjusted for inflation.

### Areas of Affordability Concern

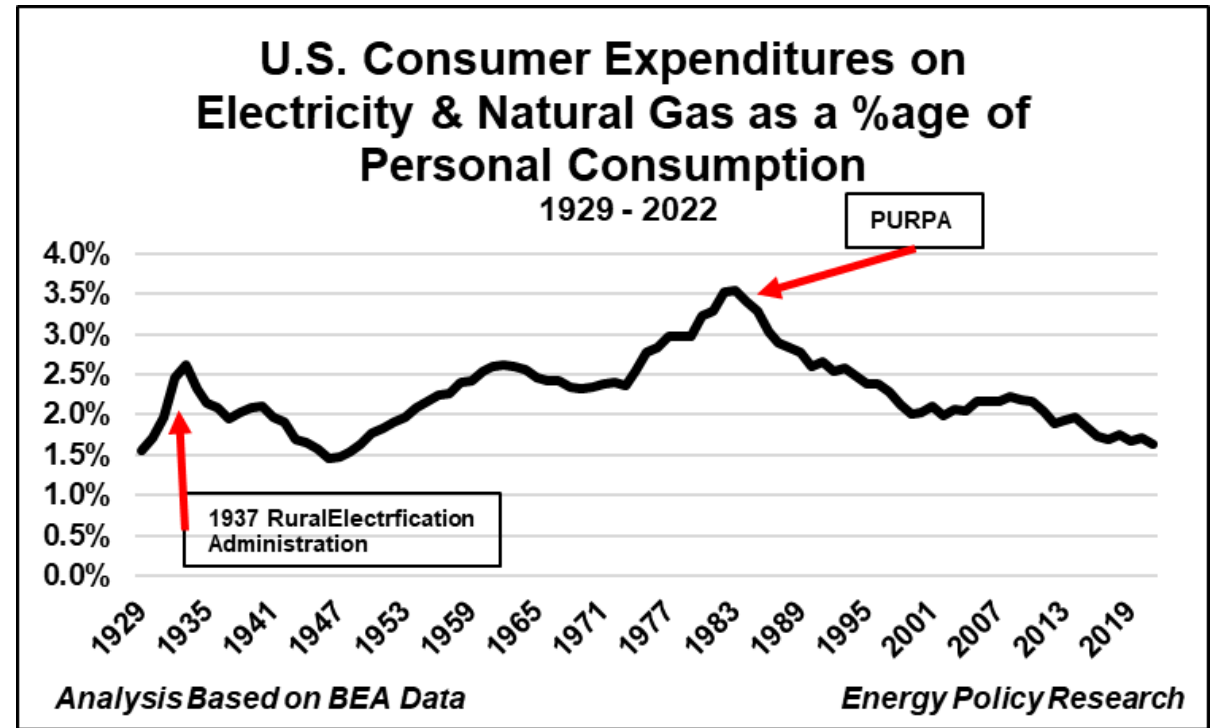
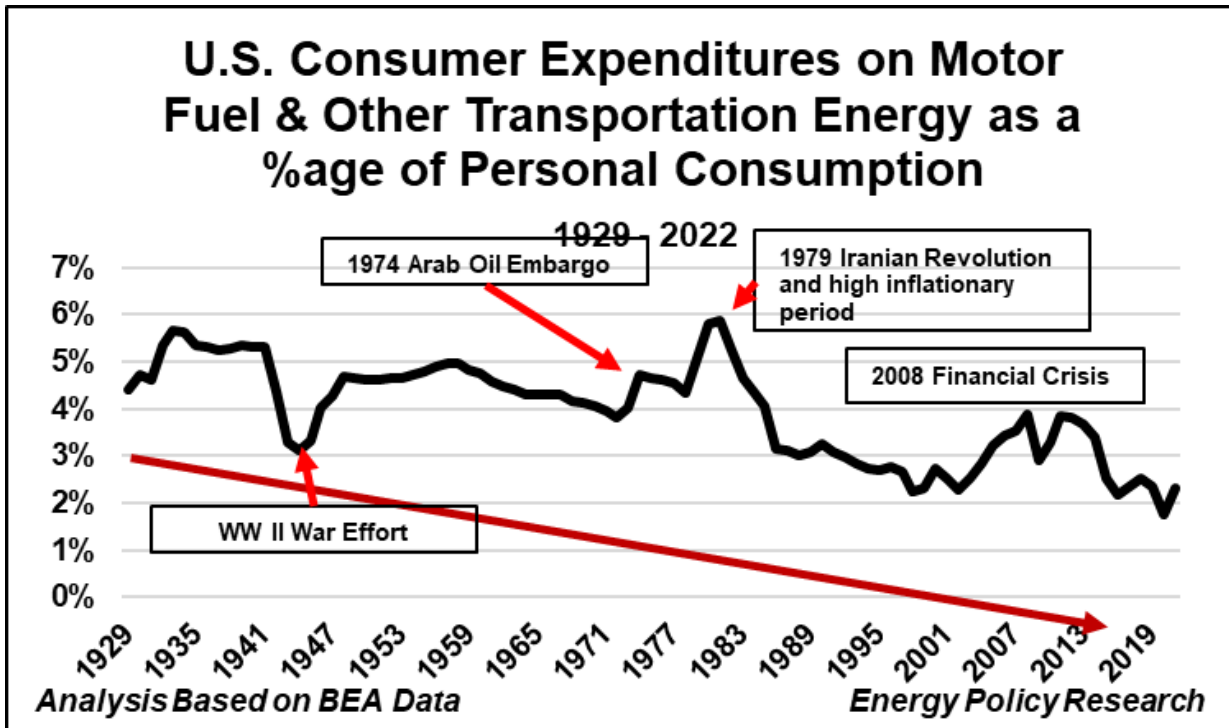
The areas of affordability concern (AAC) for each industry are the geographical areas where the AR20 scores are greater than the affordability demarcations. These demarcations represent the inflection points of the distribution of all AR20 scores across the state. The demarcations are 15% for essential electric and communications services, and 10% for essential gas and water services. The AACs are presented in census tract geography.

### 2022 Areas of Affordability Concern



Source: <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/affordability/2021-and-2022-annual-affordability-refresh>

# Comparing U.S. Expenditures on Motor Fuel vs Utility Expenditures as a %age of Personal Consumption





# Port of Los Angeles Faces Power Problem Amid Green Shift

By PAUL BERGER

The Port of Los Angeles's transition to green technology is on the blink.

The private companies that handle containers at the crucial seaport say power surges and lulls are knocking out cranes and other cargo equipment just as container terminals are relying more on the electric grid to power their operations.

The terminal operators are asking how the port expects to achieve a mandate to phase out diesel-powered machinery by 2030 when today's power supply is so unreliable. Their frustrations highlight the gap in energy infrastructure that complicates moves toward zero-emission technologies even as companies invest big sums in the transition.

Thomas Jelenić, a vice president at the Pacific Merchant Shipping Association, which represents the terminal operators, said so far this year there have been at least nine power-related outages that have affected one or more terminals.

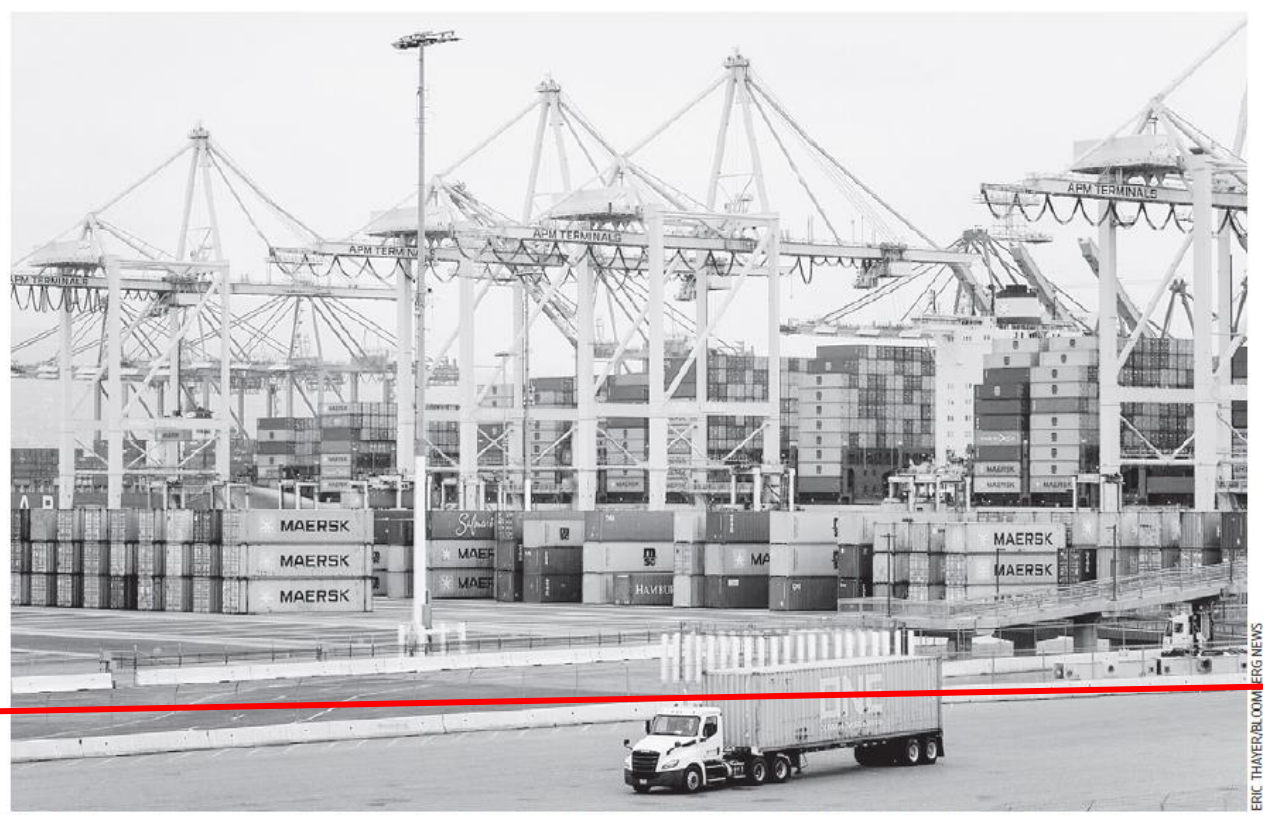
Jelenić said the dips and surges in voltage can be brief but can cause ship-to-shore cranes to reset. "That's a big deal because it stops the flow of cargo from the ship to the terminals," he said.

Several executives said the power issues are knocking out not just cranes but also the automated gates that accept and deliver boxes to trucks and the computer systems that manage the location of containers. The terminal operators must then recalibrate machinery and sometimes replace fried circuit cards before they can resume operations.

Some of the companies that operate the port's container-handling facilities declined to speak publicly about their complaints for fear of offending the municipal agencies that lease the port terminals and that supply its power.

"Our grid is a huge concern," said one terminal executive who didn't want to be identified. "I haven't seen anything that would convince me that there is a plan to support the port infrastructure in time to meet the 2030 mandate."

The terminal operators upgraded ship-to-shore cranes to run on electric power decades ago. Now, they are investing hundreds of millions of dollars in electric- and battery-powered equipment such as yard cranes and massive forklifts that carry and stack containers as well as semi-trucks that shuttle containers across docks, and the chargers that



Terminal operators are investing hundreds of millions of dollars in electric- and battery-powered equipment such as cranes.

will be needed to power the vehicles. The terminals are leased to private companies by the city-controlled Port of Los Angeles and they get their power from the Los Angeles Department of Water and Power.

Port of Los Angeles Executive Director Gene Seroka said the port's main problem isn't power supply but power distribution. "The surges and the lulls are magnified with more sensitive electrical equipment," he said.

LADWP officials say the outages this year were caused by a

series of unusual events, including equipment failure, bad weather, birds hitting power lines and vehicles hitting electric poles. Simon Zewdu, senior assistant general manager at LADWP, said one of the port's major weaknesses is that it is served by overhead power lines that are exposed to the elements.

Zewdu said LADWP is working on a \$500 million project to bring extra power to the port using underground lines, which should improve reliability. The project is expected to be complete by 2029.

A short truck drive away at the neighboring port of Long Beach, where the power lines are supplied by Southern California Edison, terminal operators say they have fewer power issues.

Still, Long Beach Container Terminal, which runs mostly on electricity and is heavily automated, has battery backup systems that plug short gaps in power, said the terminal's chief executive, Anthony Otto.

The neighboring Los Angeles and Long Beach ports com-

mitted in 2017 to phase out diesel-powered cargo-handling equipment as part of a wider push in California to reduce emissions.

The PMSA's Jelenić said reliable power supply to both ports is becoming more important as their terminals invest in battery-electric equipment. "Consistent power quality problems need to be addressed by both utilities to make sure that when we're in an all-electric environment that terminal productivity is not impacted," Jelenić said.

WSJ July 30, 2024, p. B11

**"The terminal operators are asking how the port expects to achieve a mandate to phase out diesel-powered machinery by 2030 when today's power supply is so unreliable."**



# Thank you